REMARKS

Reconsideration of the application is respectfully requested.

I. Status of the Claims

Claims 2 and 5-8 were previously canceled without prejudice or disclaimer of the subject matter therein.

Claims 1, 3, and 4 are currently pending.

A listing of the claims is provided as a courtesy to the Examiner

II. Claim Rejections Under 35 U.S.C. § 103

Claims 1 and 3-4 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,057,046 to Tsuda et al. ("Tsuda") in view of U.S. Patent No. 4,610,931 to Nemeth et al. ("Nemeth") and the Examiner's statement of ordinary skill in the art. Applicant respectfully traverses these rejections.

With respect to claim 1, the Examiner states that the sintered alloy taught by Tsuda teaches a sintered alloy useful for cutting tools, comprising WC-TiC, 5-25 wt% of a binder comprising Ni and Co, and 2-15 wt% of one or more selected from Ta carbonitride, Nb carbonitride, and others. The Examiner contends that the ranges, by percent weight, of the cemented carbide of claim 1 overlap that of the sintered alloy of Tsuda. However, the Examiner admits that Tsuda does not specifically teach the use of Ta carbonitride and Nb carbonitride satisfying the relational expression $D_{Nb}/(D_{Nb}+D_{Ta}) \geq 0.7$, as required by claim 1.

The Examiner further contends that Nemeth teaches a cemented carbide material comprising WC, Ti, Co binder, TaC and NbC. According to the Examiner, Nemeth further teaches a specific example comprising 3.1 wt% NbC and 1.9 wt% TaC, prior to the addition of nitrogen, which the Examiner contends would read on the instantly claimed ranges and relational expression.

The Examiner contends that it would have been obvious to one of ordinary skill in the art to select from the teachings of Tsuda a WC-Co material further comprising carbonitrides of Ta and Nb

falling within the instantly claimed ranges. Applicant respectfully disagrees with the Examiner's characterization of the cited references.

Claim 1 of the present application is directed to an improved cemented carbide material that can be applied as a base material for a surface coated gear cutting tool used for high speed cutting. The cemented carbide material has high fracture toughness and is provided with excellent characteristics such as high chipping resistance, high thermal crack resistance, and high wear resistance. The cemented carbide material of the present application can be represented as a system of WC-βt-Co, wherein Co is a binder phase, and βt excluding WC includes various solid solutions composed of, for example, TaC, TaN, NbC, TiC and TiN. WC and other components such as TaC, TaN, NbC, Tic, and TiN among βt form the hard phase of the base material.

A high fracture toughness in a range of 9.5 to 13 $MPa(m)^{1/2}$ is obtained when the content of Co is in a range of 12 to 17 wt%, the content of βt excluding WC is in a range of 15 to 20 wt%, wherein the total content of TaC and NbC is in the range of 5 to 7 wt%. (*See* Specification, Tables 1 and 3; Page 14, Lines 10-17). In order to improve wear resistance of the cemented carbide material, the ratio of Nb content D_{Nb} and a Ta content D_{Ta} in said βt solid solution should satisfy the relational expression $D_{Nb}/(D_{Nb}+D_{Ta}) \geq 0.7$. (*See* Specification, Page 7, Lines 15-19). The total content of Ta, Nb carbonitrides and the ratio of $D_{Nb}/(D_{Nb}+D_{Ta})$ are determined to improve wear resistance during cutting operations at high cutting speed. (*See* Specification, Page 7, Lines 11-14).

According to the samples in the present application, the relative composition by weight of the cemented carbide material is as follows: (*See* Specification, Table 1).

WC	-	64 to 72 wt%
βt excluding WC	-	15 to 20 wt%
Co	-	12 to 17 wt%

Unlike the invention described in the present application, which is directed to a cemented carbide having a basic system of WC-Co, Tsuda discloses a material that has a basic system of TiC-Ni, known as a cermet. A cermet is a material that has high thermal durability, but relatively low

mechanical strength. The cemented carbide of the present invention is composed of at least 64% WC by weight. In contrast, the material disclosed by Tsuda is mainly composed of TiCN, TiC and TiN. Therefore, the cermet based material of Tsuda does not have the same properties as those of the cemented carbide based material of the present application. For example, the fracture toughness of the cemented carbide claimed in the present application is not obtained by the cermet disclosed by Tsuda. Thus, the cermet disclosed by Tsuda, is not an appropriate base material for a high speed surface coated gear cutting tool. Therefore, the cermet disclosed by Tsuda is not in the same technical field as the cemented carbide of the present application, and it would not have been obvious to one skilled in the art to modify the cermet of Tsuda to create a cemented carbide material that can be applied as a base material for a surface coated gear cutting tool used for high speed cutting.

The composition of the material disclosed in the samples of Tsuda is as follows: (*See* Tsuda, Tables 1 and 5).

WC	-	30 to 50 wt%
Hard phase excluding WC	-	33 to 55 wt%
Co + Ni	-	14 to 20 wt%

As shown above, samples of Tsuda indicate that the hard phase excluding WC is in a range of 33 to 55 wt%. In contrast, claim 1 recites:

> A cemented carbide material for a surface coated gear cutting tool which is employed in a substrate for a surface coated gear cutting tool obtained by forming a hard coated layer on a surface of said substrate...
>
> wherein among components of a βt solid solution forming a hard phase of said cemented carbide material for a surface coated gear cutting tool, a content of components excluding WC is in a range of 15 to 20 wt%...

Thus, claim 1 requires that the content of the βt solid solution forming a hard phase excluding WC is in a range of 15 to 20 wt%. Therefore, the hard phase range disclosed by Tsuda, i.e., 33 to 55 wt%, is far greater and does not overlap with the range recited in claim 1 for the hard phase excluding WC. Accordingly, Applicant respectfully submits that the ranges, by percent weight for βt excluding WC of the cemented carbide of claim 1 do not overlap that of the cermet disclosed by Tsuda.

Further, Nemeth does not cure the deficiencies of Tsuda, Nemeth discloses a cemented carbide based material containing TiC, TaC, NbC, and TiN in addition to more than 70 wt% of WC. (Nemeth, Column 18, Lines 34-45). The ratios of $D_{Nb}/(D_{Nb}+D_{Ta})$ for Examples 4, 5, and 6 of Nemeth are calculated below.

The composition of Example 4 of Nemeth in weight basis is as follows. (Nemeth, Column 9, Lines 18-29).

TaC	-	4.1 wt%
NbC	-	3.0 wt%
TiN	-	1.5 wt%
C	-	0.1 wt%
Co	-	5.5 wt%
WC	-	85.8 wt%

Thus, $D_{Nb}/(D_{Nb}+D_{Ta}) = 3.0/(3.0+4.1) = 0.42$

The composition of Example 5 of Nemeth in weight basis is as follows. (Nemeth, Column 10, Lines 28-39).

TaC	-	1.9 wt%
TaH	-	2.0 wt%
NbC	-	3.1 wt%
TiN	-	1.9 wt%

C	-	0.4 wt%
Co	-	5.9 wt%
WC	-	84.9 wt%

Thus, $D_{Nb}/(D_{Nb}+D_{Ta}) = 3.1/(3.1+1.9 + 2.0) = 0.44$

The composition of Example 6 of Nemeth in weight basis is as follows. (Nemeth, Column 10, Lines 57-65).

TaC	-	4.1 wt%
NbC	-	3.0 wt%
TiN	-	1.5 wt%
C	-	0.1 wt%
Co	-	5.5 wt%
WC	-	85.8 wt%

Thus, $D_{Nb}/(D_{Nb}+D_{Ta}) = 3.0/(3.0+4.1) = 0.42$

Examples 4, 5 and 6 of Nemeth do not satisfy the relational expression of $D_{Nb}/(D_{Nb}+D_{Ta}) \geq 0.7$ as required by claim 1. This relational expression is one of the essential requirements to provide high fracture toughness and wear resistance. Consequently, the materials disclosed by Nemeth are not provided with the mechanical properties required for the base material of a surface coated gear cutting tool. Applicant respectfully submits that contrary to the Examiner's contention, Nemeth does not teach any example that reads on the instantly claimed relational expression, i.e., $D_{Nb}/(D_{Nb}+D_{Ta}) \geq 0.7$.

In view of the foregoing, Applicant submits that the combination of Tsuda and Nemeth does not disclose all of the limitations of claim 1. Neither Tsuda nor Nemeth disclose a cemented carbide material, wherein the content of the βt solid solution forming a hard phase excluding WC is in a range of 15 to 20 wt%. Further, neither reference cited by the Examiner discloses a material that satisfies the relational expression $D_{Nb}/(D_{Nb}+D_{Ta}) \geq 0.7$, as required by claim 1. Thus, Applicant

respectfully submits that claim 1 is not obvious in view of the references cited by the Examiner. Accordingly, Applicant respectfully requests that the rejection be withdrawn.

In light of the foregoing, the cited references fail to disclose, teach, or suggest the features of claim 1. Moreover, Applicant submits that claims 3-4 are allowable at least by reason of dependency upon an allowable base claim because they are dependent upon claim 1. Consequently, Applicant submits that the present invention is both novel and inventive over the cited references and respectfully requests that the rejections be withdrawn.

CONCLUSION

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

The Examiner is respectfully requested to contact the undersigned at the telephone number indicated below if the Examiner believes any issue can be resolved through either a Supplemental Response or an Examiner's Amendment.

It is believed that no fee is required for these submissions. Should the U.S. Patent and Trademark Office determine that additional fees are owed or that any refund is owed for this application, the Commissioner is hereby authorized and requested to charge the required fee(s) and/or credit the refund(s) owed to our Deposit Account No. 04-0100.

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Respectfully submitted,

By _____

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